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B8U
Selected US specifications from IPC sub-class
G07F

(54) Machine for renting re-usable articles

(57) A machine for renting articles e.g. video cassettes, comprises means for validating a user input e.g. a card to allow a user to operate the machine and stores the individual articles in identified compartments (22-25) from which they may be rented by a user. The compartments are arranged in groups. When an article is returned the machine opens the first empty compartment in the group of compartments from which the article was rented to receive the returned article.

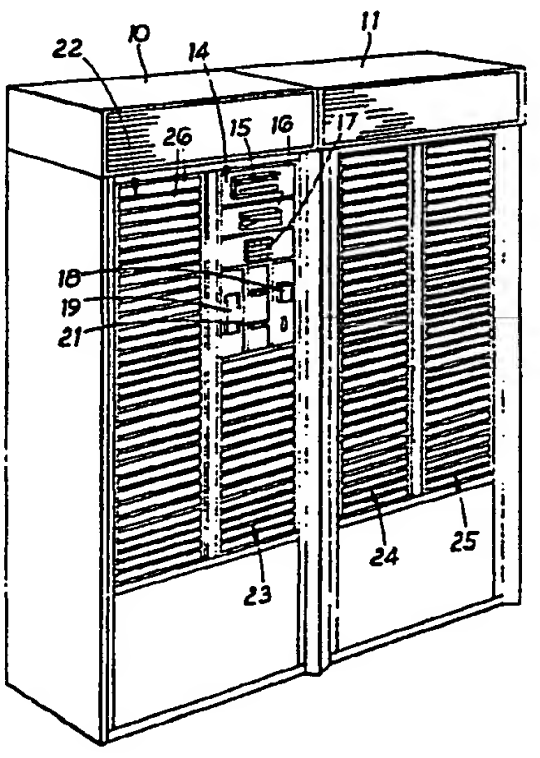

Fig. 1

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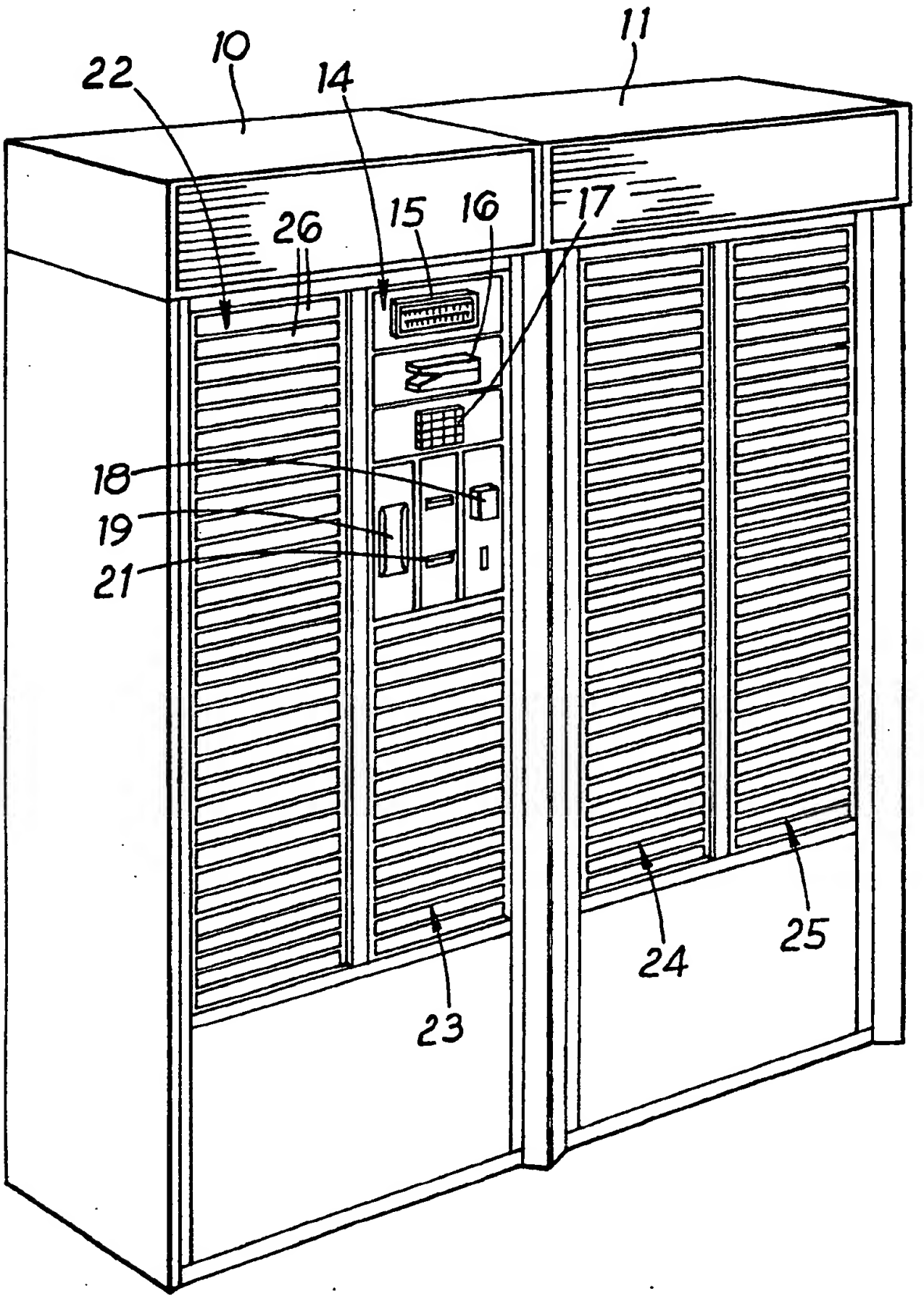

Fig. 1

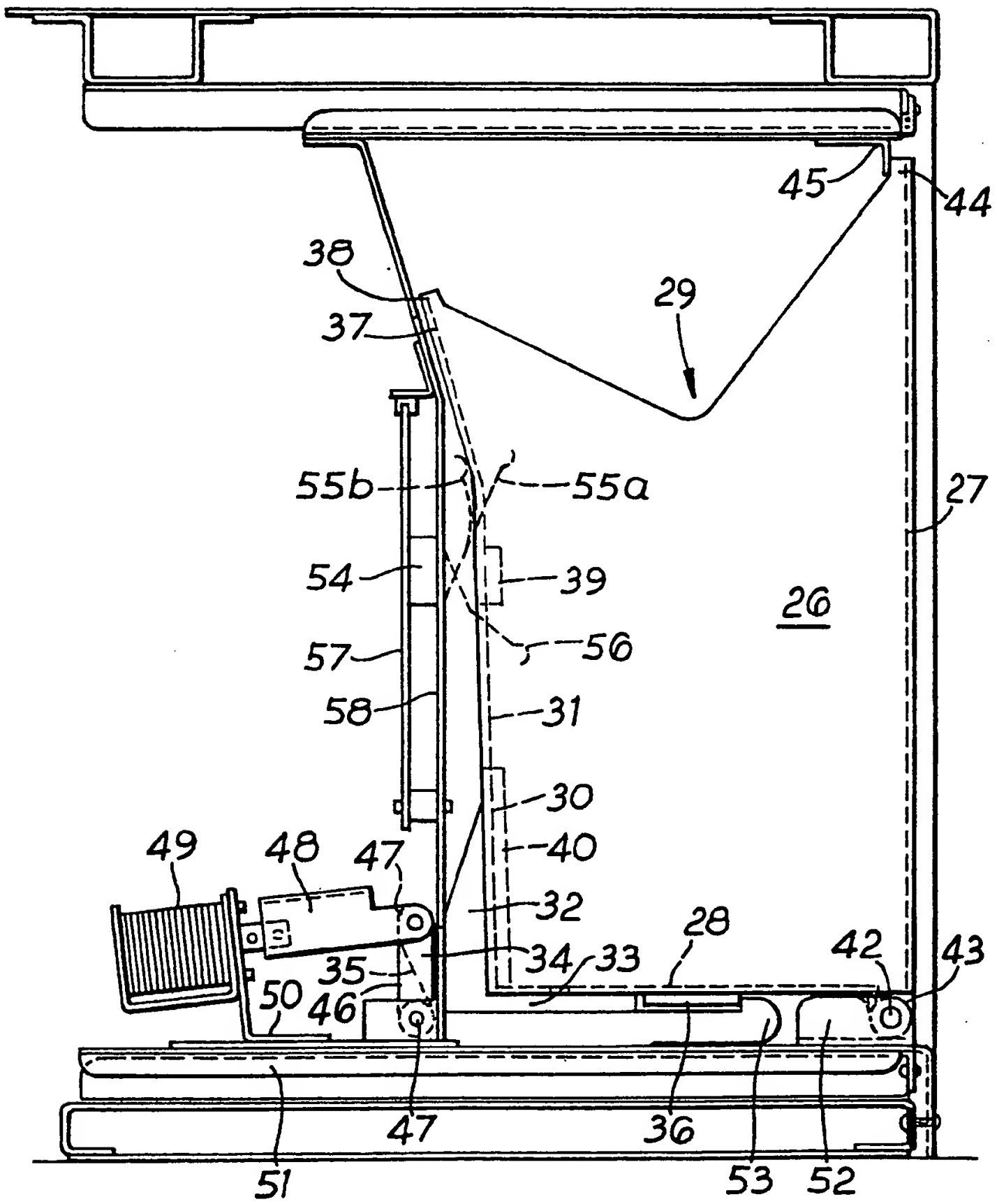
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Fig. 2

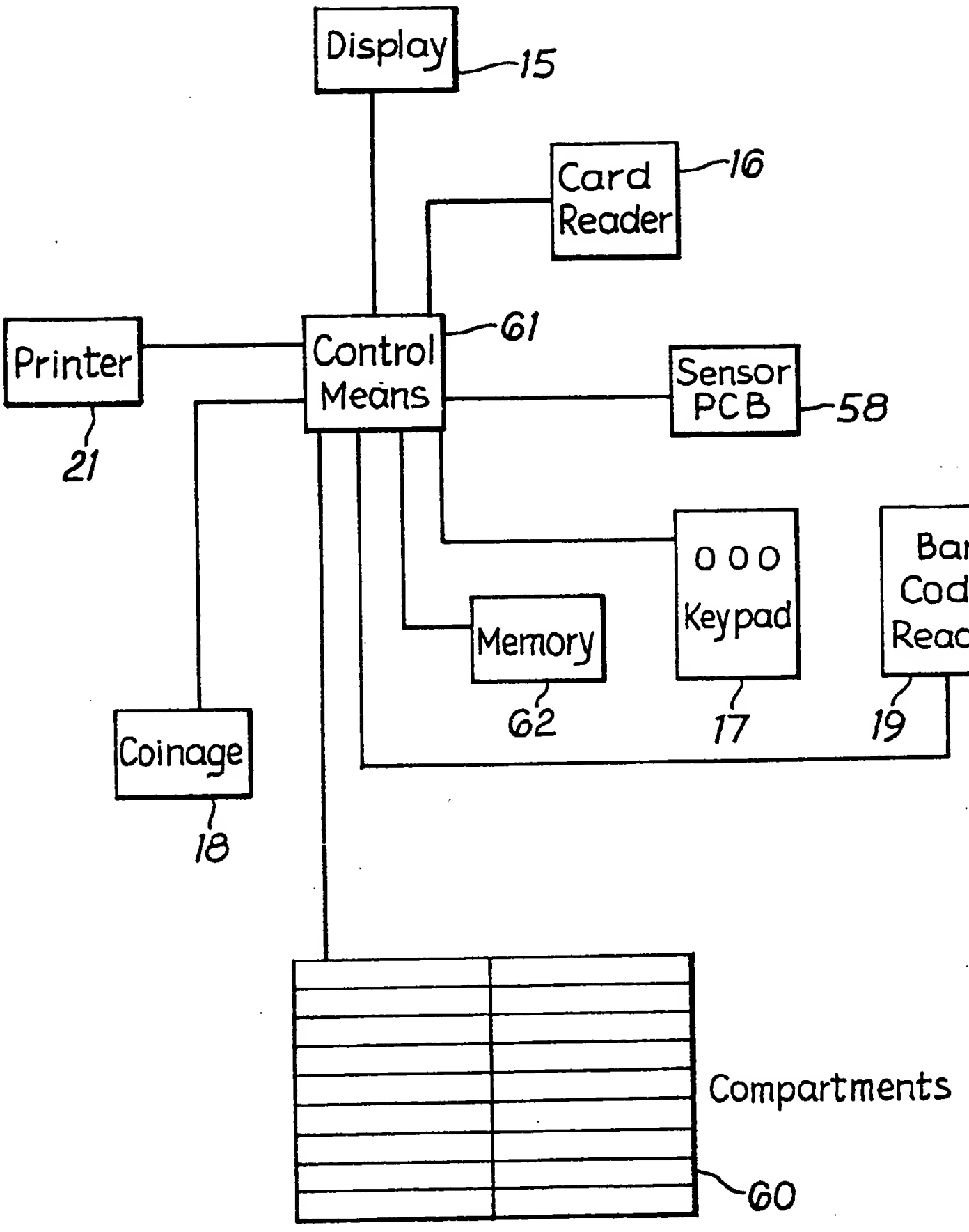
Display
15
Card Reader
16
Printer
Control Means
61
Sensor PCB
58
21
Memory
000 Keypad
Bar Code Reader
62
17
19
Coinage
18
Compartments
60

Fig. 3

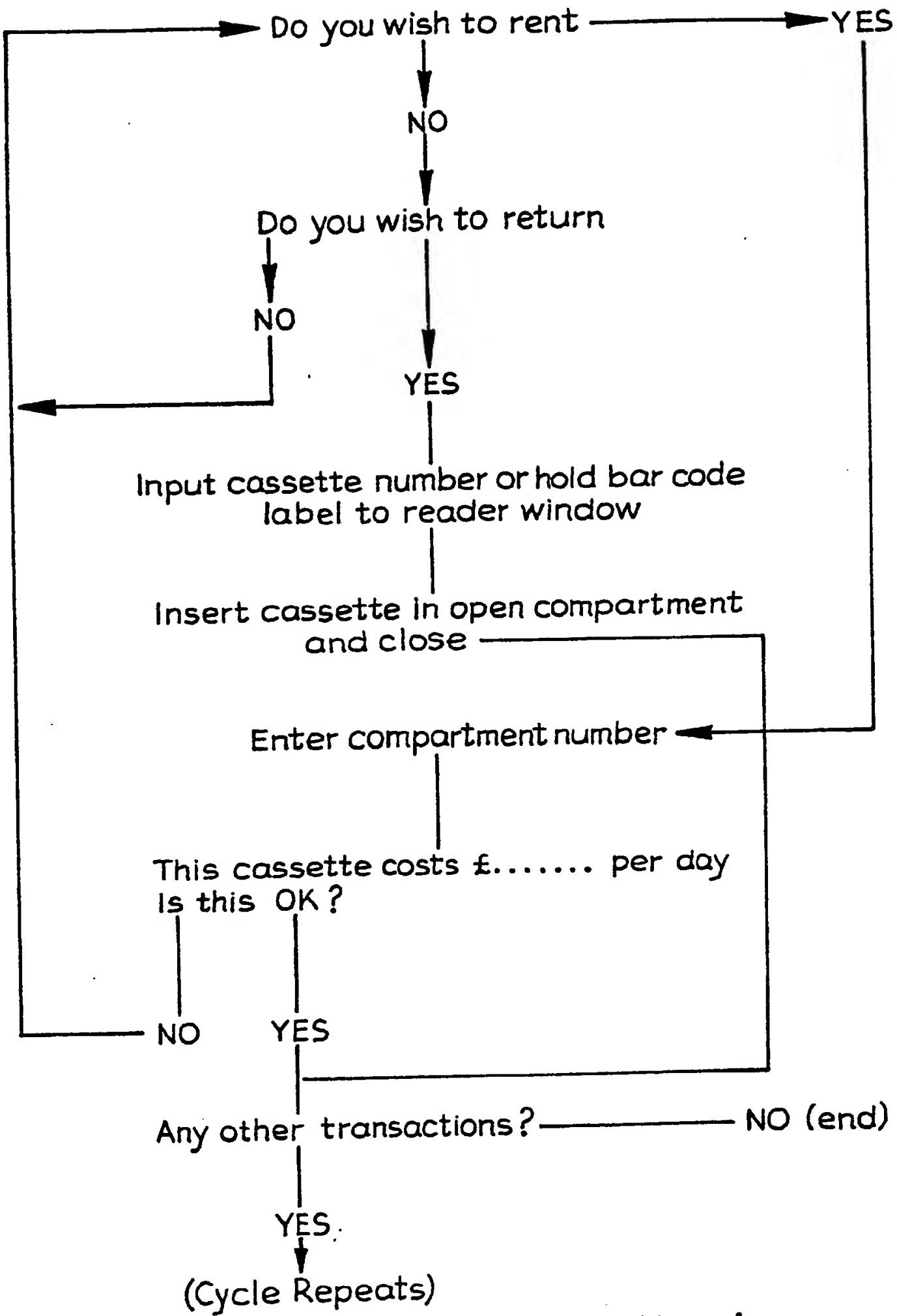
Do you wish to rent
YES
NO
Do you wish to return
NO
YES
Input cassette number or hold bar code label to reader window
Insert cassette in open compartment and close
Enter compartment number
This cassette costs £..... per day
Is this OK?
NO
YES
Any other transactions?
NO (end)
YES
(Cycle Repeats)

Fig. 4

MACHINE FOR RENTING RE-USABLE ARTICLES

This invention relates to vending machines. The term "vending machine" in the present application is intended to cover machines arranged to rent a re-usable article and accept its return. Additionally the machines may vend such articles.

It is known from European Patent Publication No. 060643 of K.J.A. McIver & Sons to provide a machine for renting video cassettes having robotic means for transferring the cassettes from their respective compartments to a delivery port and for replacing the cassettes in the compartments when delivered to the delivery port. In this apparatus a cassette is returned to the compartment from which it was last rented. It is also known from International Publication No. WO86/05292 of Term-Tronics Inc to have a machine for renting video cassettes which also has robotic means for moving the cassettes between the compartments which hold them and a port both for delivery and return of the cassettes. This publication describes that a cassette being returned is returned to the empty compartment nearest to the port. The purpose of this is to maximise the use of the machine capacity and also to save time in that the robotic means does not have to move a returned cassette further from the port than is necessary.

An object of the present invention is to provide a vending machine particularly for renting re-usable articles, such as video cassettes, which has no robotic means for moving the cassettes within the machine and in which the selection of the compartment to be opened when an article is returned enables efficient use of the machine and enables an article to be returned even

if certain of the compartments are defective.

According to the invention, therefore, we provide a vending machine for renting re-usable articles, e.g. video tape cassettes, and comprising means for validating a user input to allow a user to operate the machine; a plurality of compartments each adapted for receiving an article and each having a closed state in which an article in the compartment is not available to a machine user and an open state in which an article can be removed from or replaced in the compartment by the user, each compartment having an identifying code and each article having an identifying code, the compartments being arranged in groups, each group containing a plurality of compartments arranged in a sequence; control means having a rental mode and a return mode; user-operable input means to input said codes; the control means being capable of being activated by the user inputting a compartment code via the input means when the control means is in rental mode to open a selected compartment and being capable of being activated by the inputting of an article code via the input means when the control means is in return mode to open an empty compartment to receive the article; and a memory associated with the control means and which holds the codes of empty compartments and also the code of each article in the machine against the code of the compartment in which the article is held from time to time, the memory being updated every time an article is rented and returned, the control means being arranged to open an empty compartment when a valid article code is inputted via the input means in the return mode of the control means, the identity of the compartment selected to be opened to receive the article being the first available compartment in the group sequence which is empty in the group of

compartments from which the article to be returned was removed when it was last rented.

Each group of compartments may be destined to receive articles of a given class. In such an arrangment the compartment which is opened is in the group appropriate for the class to which the article being returned belongs, such class being established from the article code.

Preferably, the compartment codes are numeric, the arrangement being such that upon input of a valid article code with the control means in return mode, the control means opens the compartment in the appropriate group with the lowest number in the group sequence. This means that if the compartments are arranged in columns as is preferred, the upper parts to the columns are always retained full.

The code of the article to be returned may be entered by the input means manually or the input means may comprise a reader for reading the code of an article being returned. The reader may, for example, be a bar code reader reading optically or electronically.

In one arrangement, the compartments may have transparent fronts so that the contents may be viewed when an article is received in a compartment, the code on the article not being visible to the machine user when the article is in a compartment so that where the compartment code is to be input by the key pad, for example, the user cannot be misled as to the code to be inputted and must input the compartment code and not the article code.

As described in our International Patent Publication WO87/05730, each compartment may have an associated sensor to sense if there is an article in the compartment. This publication also describes the provision of a second sensor to sense whether the compartment is open or closed. A feature of the present invention is that when an article is to be returned the control means scans the sensors to find the first available empty compartment in the appropriate group sequence and also interrogates the memory to see if the supposedly empty compartment has an article code against it, only if there is no such code against the compartment does the control means open it.

The purpose of this arrangement is that the sensor may be faulty indicating that a compartment is empty when in fact it contains a tape. By interrogating the memory, therefore, a second check is carried out and only if the compartment has no article code against it is it opened. Should the machine find that there is an article code against a compartment which is indicated by its sensor to be empty then the compartment will be noted as faulty and will be taken out of service.

Preferably, also, if there is no available empty compartment in the group of compartments from which the article was last rented, the machine will be arranged to open the first available compartment in the group sequence in a group of compartments adjacent to the group of compartments from which the article was last rented.

Normally there will be no more articles in circulation than there are compartments in the machine but if there is a faulty compartment, for example as described above, then it may not be possible to return

the article to a compartment in the group from which the article was last rented and the machine allows the article to be returned to a compartment in an adjacent group.

This arrangement has the advantage that there will always be a compartment into which the article can be returned so that a user will not be left with an article which he is unable to return except with the help of the supervisor of the machine which could occur if the article had to be returned to the compartment from which it has last been rented.

The invention will now be described in detail by way of example with reference to a machine for renting video tape cassettes and with reference to the accompanying drawings in which:-

Figure 1 is a perspective view of a machine embodying the invention;

Figure 2 is a horizontal section through one of the compartments shown in Figure 1;

Figure 3 is a block diagram of the circuit of the machine; and

Figure 4 is a simplified flow chart of the machine.

Referring first to Figure 1, the machine comprises a master unit 10 and a slave unit 11 which are connected together. Further slave units can be physically connected to the unit 11 and electronically connected to the master unit 10.

The master unit 10 contains a control panel 14 which in turn contains a display 15, a "wipe-through" card reader 16, a key pad 17, a coinage mechanism 18, a bar code reader 19, and a printer outlet 21.

The cassettes are received in columns of compartments. There are four such columns of compartments indicated generally at 22, 23, 24 and 25. The columns 22 and 23 are in the master unit, the column 23 being below the control panel, and the columns 24 and 25 are in the slave unit. Each column comprises a group of compartments some of which are indicated in the column 22 at 26.

Referring now to Figure 2, this is a horizontal section through one of the columns 22 to 25 and shows a compartment 26.

The compartment is moulded from a high strength transparent plastic material and is in the form of a pocket of generally rectangular cross section. Thus the pocket has a transparent front face 27, a closed end 28 and an open end 29. The compartment has a back face 30 having an aperture 31 therein. A projection 32 in the form of a rib extends rearwardly from the back face 32 and is continued at 33 along the closed end 28. The rib has an abutment surface 34 and an inclined surface 35. The rib extension 33 on the closed end terminates in a pocket 36. It will be seen that the open end 29 of the container is cut away so that an article received therein may be grasped when the container is open, as will be described, and that the rear face 31 diverges at its upper end, in Figure 2, as indicated at 37 ending in an abutment 38.

The rear face 30 is formed on its internal surface with pairs of ribs 39 and 40 on either side of the aperture 31 and these ribs provide a groove between them which can be used to ensure that an article to be contained in the compartment can only be received therein in one orientation.

The pocket is pivoted about an axis which in use is vertical and is indicated at 42, the pocket being provided with an apertured lug 43 for that purpose. The compartment in Figure 2 is shown in a closed position and has an abutment 44 which engages a fixed abutment 45 on the supporting structure of the unit.

The compartment is held in a closed position by a pair of links 46 which are pivoted at 47 to the supporting structure and, at their upper ends in Figure 2, are connected by a pin 47 which engages the abutment surface 34. Also secured to the pin 47 is a link 48 which in turn is connected to a solenoid 49. The link 48 is spring urged to the right in Figure 2 so that the parts normally occupy the positions shown in that Figure. The solenoid is mounted at 50 on the supporting structure 51 which also carries a support 52 for the pivot axis 42.

A U-shaped spring 53 has one end received in the pocket 36 and the other end engages the structure 51. The arrangement is such that if the solenoid 49 is energised it pivots the links 46 in an anti-clockwise direction in Figure 2, the pin 47 comes out of engagement with the abutment surface 34 and the compartment is moved by the spring 53 to an open position in which the abutment 38 is midway between the position shown in Figure 2 and the abutment 45. The customer may then open

the compartment against the spring 53 until the abutment 38 engages the abutment 45. Release ofthe compartment results in the spring returning it to its midway position and then it may be closed by the customer. In the fully open position an article in the compartment can be removed or replaced.

The container is shut manually and as it is moved to its closed position the surface 35 engages the roller 47 and retracts the link 48 until the compartment reaches its fully closed position whereupon the link 48 moves to the right in Figure 2 and the pin 47 again engages the abutment surface 34 to hold the compartment in a closed position.

For each compartment there are two sensing means which comprise micro-switches and sensing arms. The micro-switches are indicated at 54 and one of them has a sensing arm 55 which has a free position shown at 55 a . This arm senses whether or not a compartment is in its open or closed position by engaging the rear face 30 of the compartment as shown at 55 b . The second micro-switch has an arm 56 which projects through the aperture 31 into the interior of the compartment as shown in Figure 2 and can sense whether or not there is an article in the compartment.

If, after a compartment has been opened, it is not shut by the user of the apparatus, this will be sensed by the arm 55 which will disable the apparatus until the compartment has been shut.

The micro-switches are carried on a printed circuit board 57 secured to a plate 58. Each board 57 runs the

whole length of a module of eight compartments and carries all the micro-switches for the containers in the module.

The machine is designed to dispense video tape cassettes and it is important to the operation of the machine when used with such cassettes, that the name on the cassette can be read through the transparent front face 27 of the container. It is therefore important that the tape be placed in the compartment in an appropriate position. However it is desired that the identifying code on the cassette is not visible through the front of the container.

This may be effected by having a transparent sleeve, not shown, which in turn contains the tape cassette, not shown, and which is so arranged that it will only fit into the container in one orientation by virtue of the groove between the ribs 40. Moreover the cassette will only fit into the sleeve in one orientation.

Further details of the mechanism shown in Figure 2 are described in our International Application No. PCT/GB87/00197 (International Publication Number WO87/05730) to which reference should be made.

Referring now to Figure 3, the machine comprises the groups of compartments which in this figure is indicated at 60 and which are controlled by control means indicated schematically at 61. The control means is connected to the display 15, the card reader 16, the key pad 17 the coinage mechanism 18, the bar code reader 19, the printer 21, a memory 62 and the sensors 55 and 56 of all the compartments via the sensor printed circuit boards 58.

Preferably, the machine is arranged to be operated by a so called club card i.e. a card specially intended for use on the machine. Thus a user may purchase a club card for a given sum and this will entitle him to a certain number of rentals or he may be allowed a number of rentals on credit.

The sequence of operation of the machine is, referring to Figures 3 and 4, as follows. The user will pass his club card through the card reader 16. This will read the information on the card including an identification code for the user. If this is a valid identification code, the user will be enabled to use the machine. The first time that the club card is passed through the card reader 16 it will establish a credit, the card credit, which will be stored in the memory 62 against the identification code on the card.

The card credit may be set to a common value for all users by the machine operator so that when the card is first passed through the card reader the card credit is set in the memory against the identification code on the card. Alternatively the user or a code on the card may "select" one of a number of card credits pre-programmed into the machine and record this in the memory when the card is first used in the machine. Yet again an amount may be pre-programmed on the card and this amount set up as a card credit the first time that the card is used in the machine.

Referring now to Figure 4, the sequence will be that the user will be asked if he wishes to rent a cassette. Assuming he says 'yes' by operation of the key pad 17 he will be asked to insert the appropriate compartment number also by means of the key pad. The user can see

through the transparent front of the compartment the cassette which he requires.

Preferably each of the compartments will be numbered. Alternative arrangements may be made for selection of the desired compartment, for example each compartment may have an operating button by its side or there may be a series of numbered buttons or any other convenient means may be used to identify the compartment required.

The machine will then display on the display how much the cassette rental costs and ask if this is acceptable. If the user says 'yes' by appropriate operation of the key pad then the control means will operate to open the selected compartment from which the user will take the cassette. After the user has taken the cassette he will close the compartment. There will be an audible signal if the compartment is left open and the machine will be disabled until the compartment is closed.

The control means 61 and the memory 62 will operate so as to decrease the card credit in the memory by the amount of the rental charge for the cassette. The rental charge will be computed for an initial period, for instance 24 hours, and may or may not include a security amount equal to the value of the cassette. After the initial period, the rental for additional periods will be debited to the card credit. Alternatively on return of the cassette the actual total rental cost is debited. The memory 62 will also record that the compartment from which the cassette has been removed is empty.

If the machine is fitted with a printer as indicated then the printer can be arranged to print out a receipt showing the amount which the user has been debited.

Each cassette has an identifying code. This may be a number and/or may be a bar code. When the cassette is in the compartment a user cannot see the article code so cannot be misled when entering the compartment number to rent a cassette. When the user wishes to return the cassette he will pass his club card through the card reader 16 which will identify him. Assuming that the cassette has been returned within the maximum allowable rental period the user may then enter the number of the cassette on the key pad 17 or, if a bar code reader such as 19 is provided, may place the cassette in front of the bar code reader which will read the code on the cassette. Figure 4 shows the series of operations. When the machine has received a valid article code number the control means will open an empty compartment for the receipt of the cassette and the user will then close the compartment as described above, after inserting the article and the transaction is complete.

The compartments in each group are numbered in a numeric sequence. Each column or part column may constitute a group of a plurality of compartments which is destined to receive cassettes of a certain subject matter, for example westerns may go in one group, science fiction in another group and so on. In such a case the memory 62 will hold the numbers of the compartments in groups and will open the compartment with the lowest number in the group sequence in the group appropriate to receive the returned cassette, the code of the cassette indicating the group to which it is to be returned.

It may be that, for some reason, one of the compartments in the group from which the cassette was last rented is unavailable and there is no compartment available in that group into which a cassette to be returned can be inserted. In this case the control means will open the first available compartment in the group sequence in a group of compartments adjacent to the group of compartments from which the article was last rented. By this means, space can always be found in the machine for a cassette even if it cannot be returned to its original group. Next time the cassette is rented, however, it will be returned to its original group if an empty compartment is available therein.

As has been mentioned above, it is possible that the sensor 56 associated with a compartment may be faulty. Thus when a cassette comes to be returned the control means 61 scans the sensors 56 to find the first (i.e. lowest in the numeric sequence) available empty compartment in the appropriate group sequence. However, as a check it also interrogates the memory 62 to see if the supposedly empty compartment which the scan through the sensors 56 has found does have an article code against it in the memory 62. Only if there is no such code against the compartment does the control means open it. If there is an article code against the compartment in the memory this indicates that the sensor 56 of that compartment is faulty as indicating the compartment empty when in fact there is a cassette therein.

There is thus a second check on whether or not a compartment is empty before it is opened with possible loss of a tape if the compartment were opened with a tape therein.

The memory 62, as has been described, records the list of empty compartments so that an appropriate empty compartment can be opened when a cassette is returned. Moreover, when a cassette is returned the memory will record, against the cassette code, the compartment code so that a record is retained of the movements of the cassettes and if a cassette is returned in a damaged state the record will show who the last renter of the cassette was.

The machine has been described as being arranged for rental of cassettes. Additionally it may be arranged to sell cassettes and the flow chart in Figure 4 will be modified accordingly to give the user an opportunity of deciding whether to rent or buy.

Instead of the sensors 55 or 56 each compartment contains means for detecting whether or not a valid article has been inserted into the compartment, for example the means disclosed in our Patent Application GB 8720298.

The arrangement for recording and decrementing the card memory briefly described above are the subject of our International Publication No. [Application 8709234GB].

CLAIMS

1. A vending machine for renting re-usable articles, e.g. video tape cassettes, and comprising means for validating a user input to allow a user to operate the machine; a plurality of compartments each adapted for receiving an article and each having a closed state in which an article in the compartment is not available to a machine user and an open state in which an article can be removed from or replaced in the compartment by the user, each compartment having an identifying code and each article having an identifying code, the compartments being arranged in groups, each group containing a plurality of compartments arranged in a sequence; control means having a rental mode and a return mode; user-operable input means to input said codes; the control means being capable of being activated by the user inputting a compartment code via the input means when the control means is in rental mode to open a selected compartment and being capable of being activated by the inputting of an article code via the input means when the control means is in return mode to open an empty compartment to receive the article; and a memory associated with the control means and which holds the codes of empty compartments and also the code of each article in the machine against the code of the compartment in which the article is held from time to time, the memory being updated every time an article is rented and returned, the control means being arranged to open an empty compartment when a valid article code is inputted via the input means in the return mode of the control means, the identity of the compartment selected to be opened to receive the article being the first available compartment in the group sequence which

is empty in the group of compartments from which the article to be returned was removed when it was last rented.

2. A vending machine according to Claim 1 wherein each group of compartments is destined to receive articles of a given class and wherein the compartment which is opened is in the group appropriate for the class to which the article being returned belongs, such class being established from the article code.

3. A machine according to Claim 1 or Claim 2 wherein the compartment codes are numeric, the arrangement being such that upon input of a valid article code with the control means in return mode, the control means opens the compartment in the appropriate group with the lowest number in the group sequence.

4. A vending machine according to any one of the preceding claims wherein the input means comprises a reader for reading the code of an article being returned.

5. A vending machine according to any one of the preceding Claims wherein, when an article is received in a compartment, the code on the article is not visible to the machine user.

6. A vending machine according to any one of the preceding claims wherein each compartment has an associated sensor to sense if there is an article in the compartment and wherein, when an article is to be returned, the control means scans the sensors to find the first available empty compartment within the appropriate group sequence and also interrogates the memory to see if the supposedly empty compartment found has an article

code against it, only if there is no such code against the compartment does the control means open it.

7. A vending machine according to any one of the preceding claims wherein if there is no empty compartment available in the group of compartments from which the article was last rented, the machine opens the first available compartment in the group sequence in a group of compartments adjacent to the group of compartments from which the article was last rented.

8. A vending machine substantially as hereinbefore described with reference to the accompanying drawings.

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